



A.D. 1856 N° 237.

SPECIFICATION

OF

WILLIAM HENRY LANCASTER

AND

JAMES SMITH,

FURNACES, &c.

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A.D. 1856 N° 237.

Furnaces, &c.

LETTERS PATENT to William Henry Lancaster and James Smith, both of Liverpool, in the County of Lancaster, for the Invention of “**IMPROVED ARRANGEMENTS FOR THE APPLICATION OF GAS AND ATMOSPHERIC AIR TO THE GENERATION OF HEAT IN FURNACE OR OTHER FLUES, AND THE CONSUMPTION OF SMOKE.**”

Sealed the 18th July 1856, and dated the 29th January 1856.

PROVISIONAL SPECIFICATION left by the said William Henry Lancaster and James Smith at the Office of the Commissioners of Patents, with their Petition, on the 29th January 1856.

We, **WILLIAM HENRY LANCASTER** and **JAMES SMITH**, both of Liverpool, in
5 the County of Lancaster, do hereby declare the nature of the said Invention for “**IMPROVED ARRANGEMENTS FOR THE APPLICATION OF GAS AND ATMOSPHERIC AIR TO THE GENERATION OF HEAT IN FURNACE OR OTHER FLUES, AND THE CONSUMPTION OF SMOKE,**” to be as follows:—

These improved arrangements consist in placing the retort or retorts in
10 which the gas is generated in the fire-place of any boiler or other furnace, in the flues of which it is desirable to obtain additional heat, and to effect the consumption of smoke.

The arrangements for the combustion of the gas in the flues consist of a pipe or pipes for conveying the gas, when manufactured, to several sets of jets
15 disposed at suitable intervals along the course of the flues, and of plates

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arranged to form channels in the flues to convey to the several sets of jets a supply of atmospheric air, adequate to support active combustion. By these arrangements, the double object of generating heat and consuming smoke by the application of gas alone, or in combination with atmospheric air, or of atmospheric air alone is completely attained.

5

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said William Henry Lancaster and James Smith in the Great Seal Patent Office on the 29th July 1856.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, **WILLIAM HENRY LANCASTER** and **JAMES SMITH**, both of Liverpool, in the County of Lancaster, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-ninth day of January, in the year of our Lord One thousand eight hundred and fifty-six, in the nineteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the said William Henry Lancaster and James Smith, Her special licence that we, the said William Henry Lancaster and James Smith, our executors, administrators, and assigns, or such others as we, the said William Henry Lancaster and James Smith, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**IMPROVED ARRANGEMENTS FOR THE APPLICATION OF GAS AND ATMOSPHERIC AIR TO THE GENERATION OF HEAT IN FURNACE OR OTHER FLUES, AND THE CONSUMPTION OF SMOKE,**" upon the condition (amongst others) that we, the said William Henry Lancaster and James Smith, our executors or administrators, by an instrument in writing under our or their hands and seals, or under the hand and seal of one of us or them, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said William Henry Lancaster, one of the parties hereto, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

35

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Our improved arrangements consist in placing the retort or retorts in which the gas is generated in the fire-place of any boiler or other furnace, in the flues of which it is desirable to obtain additional heat and to effect the consumption of smoke.

5 The arrangements for the combustion of the gas in the flues consist of a pipe or pipes for conveying the gas, when manufactured, to several sets of jets disposed at suitable intervals along the course of the flues, and of plates arranged to form channels in the flues to convey to the several sets of jets a supply of atmospheric air, adequate to support active combustion. By these arrange-
10 ments, the double object of generating heat and consuming smoke by the application of gas alone, or in combination with atmospheric air, or of atmospheric air alone, is completely attained.

In order to explain our said Invention as completely as possible, we now proceed to describe the best means we are acquainted with for carrying the
15 same into practical effect, reference being had to the illustrative Drawings annexed to these Presents, and to the numeral figures and letters of reference marked thereon respectively as follows :

DESCRIPTION OF THE DRAWINGS.

At Sheet 1, Figure 1 represents a longitudinal and vertical section of a
20 boiler furnace, fitted with retorts for generating gas, and with hollow fire bars and channels for conveying heated atmospheric air into the flue in which it is required to generate heat and to consume smoke. A is the retort in which gas may be generated, either from the distillation of coal, or from the decomposition of water, or from the double or combined decomposition of both
25 coal and water, as set forth and described in the Specification of a Patent dated Tenth August, One thousand eight hundred and fifty-five, No. 1811, granted unto us the said William Henry Lancaster and James Smith. B is the bridge of the furnace, perforated along the line *b, b*, to allow a portion of the atmospheric air to pass through the hollow fire bars N, or through the
30 opening P, as the case may be, to the flue immediately behind the retort. D¹, D², D³, D⁴, are plates of metal or other material, fixed in the flue of the furnace and forming additional channels for the supply of successive currents of atmospheric air to the said flue. E, E, E, represent a portion of the return flue and "up-take" leading therefrom. According to the above arrangement,
35 the gas, when generated in the retort, escapes through openings at *a, a, a*, and mixing with the carbonaceous vapours and flame from the furnace, together with the atmospheric air previously heated in its passage through the hollow fire bars, burns with intense heat and inflames the carbonaceous particles which

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would otherwise pass off in smoke, whilst the successive supplies of heated atmospheric air entering through the passages formed by the plates D^1, D^2, D^3, D^4 , serve to support the flame thus formed until the combustion of the smoky matter is effected, and only a hot colorless vapour escapes into the further parts of the flue. 5

We would here observe, that although the Drawing only represents one retort placed in the furnace, in practice it will be found desirable to employ two retorts for the purpose of securing a continuous supply of gas. The foregoing arrangements are simple, and will generally be found quite efficient when the heat is required to be diffused only over a limited extent of flue surface. 10 But when the object of the Invention is to maintain an intense heat over a greater length of flue, it will then be necessary to convey the gas along the flue in pipes that it may be ignited at suitable points. To be used thus, however, the gas must undergo a certain degree of purification, which may be effected in apparatus of the following construction. 15

Figure 2 represents an end view of a boiler furnace with purifier, &c. attached thereto. A, A, are retorts, from whence the gas generated therein is conveyed through pipes B, B, into cisterns F, F, instead of escaping by apertures at the end of said retorts as at a , Figure 1. The cisterns F are filled with water up to the line f, f , and the gas escapes from the tubes B, B, 20 about three inches below the line f , and passing upwards through the water into the cavities at C, C, is purified by being divested of the grosser particles of tar mixed with the gas, which would otherwise pass off with the gas and speedily choke the pipes through the gas passes into the flues. R, R, are branch pipes for conveying the gas, when purified, from the cavities C, C, 25 into a main pipe T, which passes under the hollow furnace bars N, N, (hereinafter fully described) into the flue.

Figure 3 represents an horizontal section of a boiler furnace, shewing the course of the flues, and mode of arranging and disposing the pipes employed for the distribution of the gas. The main pipe T, employed for conducting gas 30 into the flue, is perforated on its upper surface with holes of about one-twelfth of an inch diameter, and about three inches distance apart (more or less). P, P, are cross pipes perforated on their upper surface with holes of about one-twelfth of an inch diameter, and about one inch and a half apart, more or less. E, E, return flues, partly shewn at Figure 1. The channels employed for 35 conveying heated air to the precise points at which the combustion of the gas must take place are not shewn in reference to Figure 3, as it is obvious that they must be modified to suit the circumstances of the case. For example, when only a small quantity of gas is emitted immediately beyond one bridge

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only a comparatively small quantity of heated atmospheric air will be required at that point; whilst, on the other hand, a more plentiful supply of heated air will be required at the points where the pipes P, P, are situated, and where the chief combustion will necessarily take place. We have found in practice that
5 the best results are obtained when the supply of heated air is in the proportion of about four volumes thereof to one of gas. We would here remark, that although the above arrangement of the perforated pipes T and P in a flue constructed as exhibited at Figure 3 is the best we are acquainted with for effecting the objects of our said Invention; at the same time we do not intend to limit
10 ourselves to this precise or particular disposition of said pipes, and also of the channels employed for conveying the heated atmospheric air into the flue, which will vary according to the structure of the flues to which they are to be applied. And as regards the position of the retorts in the furnace, we would observe, that in practice we have found the most suitable distance of such retorts from
15 the surface of the fire bars to be about eighteen inches, as at that distance the bridge of the furnace is sufficiently raised to cause the flame of the furnace to play around the retorts into the flue, and thereby to secure an uniform amount of heat as far as practicable. Further, the retorts may be shaped either round or flat, and be made either of metal, fire-clay, pipe-clay, or compounds of these
20 substances; and this applies also to the perforated pipes T and P, and also the plates or tubes of which the air passages may be constructed. The cisterns or purifiers F, F, may be made of various sizes, according to circumstances; but, for a retort capable of distilling a charge of about two hundred weight of coal, we have found a cistern five feet deep, two feet in diameter, with two feet of
25 water therein to answer well. Lastly, the atmospheric air may be heated either by passing through hollow fire bars, as before stated, into the chamber formed by the bridge of the furnace, which plan we prefer, or the air may pass through the opening P under the ash-pit; the door P of which may be opened or closed at pleasure by means of a lever, so placed as to be within reach of the stoker.
30 We now proceed to a description of Sheet 2 of the Drawings, observing, that although for most furnaces the foregoing arrangements would be found applicable, still, for such furnaces as are limited in height, and in which there would not be sufficient space for the introduction of the retorts without encroaching on the furnace space, in such cases we propose to make use of an
35 arrangement of hollow fire bars, each constituting a retort for generating gas. The following is the mode of arranging the said fire bar retorts.

Figure 4 is a longitudinal and vertical section of a boiler furnace, &c., showing hollow fire bars and pipes connected thereto for distributing the gas. A, A, is a hollow cast-iron fire bar projecting about twelve inches from the furnace

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door, and about twelve inches at the opposite end beyond the back of the bridge of the furnace into the air chamber E, formed by the bridge G; D is a screw cap for closing the mouth of the fire bar retorts N when it is desired to pass steam through the same, as at Figure 7; B, B, are screw nipples for connecting thereto the steam pipes *c, c, c*, as at Figure 10; P is a door for supplying air to the chamber E; D, D, D, are chambers, formed either of plates or tubes, for conveying successive currents of heated air to the requisite parts of the flue, as at Figure 1 of Sheet 1; F, F, are pipes for conveying the gas from the fire bar retorts, (and passing through the channels D, D,) delivering it at the points *h, h*; or it may be delivered as at Figure 3 of Sheet 1, the pipe T, T, being attached to the end of the fire bar retort A, A, at Figure 4; or the gas may be delivered entirely in or at the end of the furnace.

Figure 5 is a transverse and vertical section (drawn full size) of a hollow fire bar, serving also the purpose of a gas retort, with screw nipple for securing the steam pipe *c*, shown at Figure 9.

Figure 6 is a front view of the fore end of said fire bar retort, showing projecting screw nipple E, hereafter described; F, F, are projecting shoulders formed at both ends of each of said bars, as at Figure 10.

Figure 7 is a longitudinal and vertical section of the fore part of the aforesaid hollow fire bar retort, with screw nipple and screw cap attached; and as regards the ends of those fire bars at which the exit of the gas is to take place, we form such parts with a screw nipple, similar to that marked E, at Figure 6, for the purpose of connecting thereto the pipes employed for delivering the gas, and those bars which simply return the gas instead of having a screw nipple may be formed closed.

Figure 8 is a front elevation of a furnace, showing hollow fire bar retorts and steam pipes in transverse section, fitted with cocks X, X, X, for shutting off or regulating the supply of steam when necessary. *c, c, c*, are steam pipes for supplying the fire bar retorts with steam; K, stop cock, for turning off the gas from the main service pipe, as herein-after stated.

Figure 9 is a horizontal section of the above hollow bars, showing by the arrow's flight the course of the gas through the same.

Figure 10 is a side elevation of the exterior of one of the said fire bars.

Figure 11 is a transverse and vertical section of said fire bar taken across the middle thereof. In this arrangement, notwithstanding gas may be generated without the fire bar retorts being charged, the quantity of gas will be considerably increased by charging such said fire bar retorts with a decomposing agent, such as small pieces of scrap iron, wire, or small pieces of charcoal, thus presenting a greater decomposing surface to the action of the

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steam. In situations contiguous to gas works, or near the company's main, we propose to connect a branch pipe thereto, and to a steam pipe, as at K, Figure 8, by which we can use coal gas for the first lighting up of the fire, or we can use coal gas and water gas alternately. The coal gas in passing through
5 the heated fire bars would increase its volume and deposit its carbon, and such carbon would form a decomposing agent for the steam.

Having now described the nature and object of our said Invention of "Improved Arrangements for the Application of Gas and Atmospheric Air to the Generation of Heat in Furnaces or other Flues, and the Consumption of
10 Smoke," together with the best means we are acquainted with for carrying the same into practical effect, we would remark, in conclusion, that we do not claim the exclusive use of any of the separate parts above mentioned and referred to, except in so far as the same may be employed in combination and for the purposes of our said Invention. And we hereby declare that what we
15 claim as the Invention intended to be secured to us by the above in part recited Letters Patent, is,—

First, the construction and use of apparatus arranged as described by reference to the Drawings hereunto annexed, whereby gas generated in the furnace, in the flues of which it is to be consumed, may be applied for the con-
20 sumption of smoke and generation of heat, as above described.

Secondly, the construction and use of apparatus arranged as described by reference to Figures 1 and 3 of Drawings hereto annexed, whereby gas with or without the addition of atmospheric air may be applied for the consumption of smoke and generation of heat, as above described.

25 Thirdly, the construction and use of apparatus arranged as described by reference to Figure 1, whereby atmospheric air alone, or with gas, may be applied to the consumption of smoke and generation of heat, as above described.

In witness whereof, I the said William Henry Lancaster, one of the
30 parties hereto, have hereunto set my hand and seal, this Twenty-third day of July, in the year of our Lord One thousand eight hundred and fifty-six.

WILLIAM HENRY LANCASTER. (L.S.)

Witness,

35 ALEX. PRINCE, Patent Agent,
4, Trafalgar Square, Charing Cross.

LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1856.

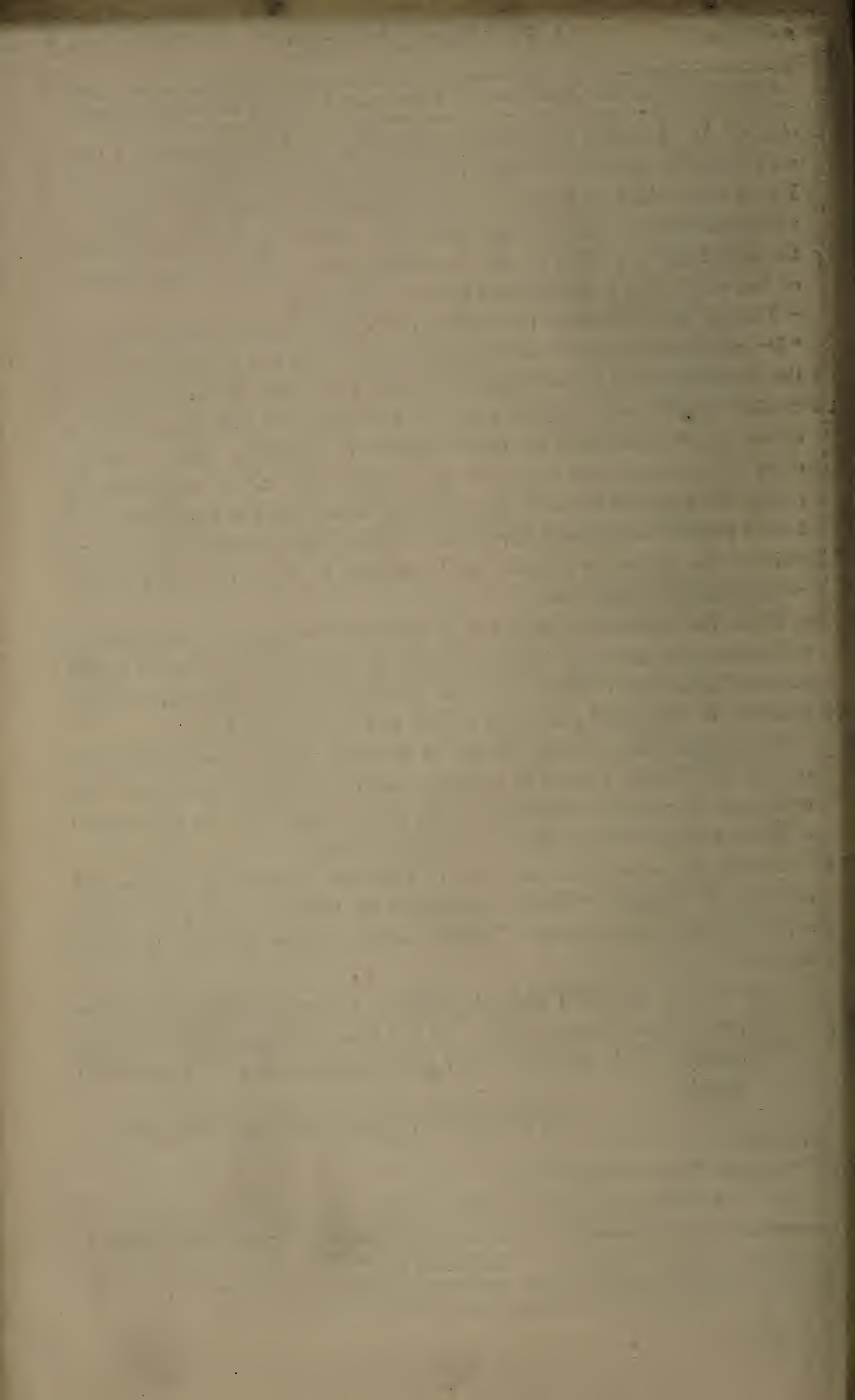


FIG. 1.

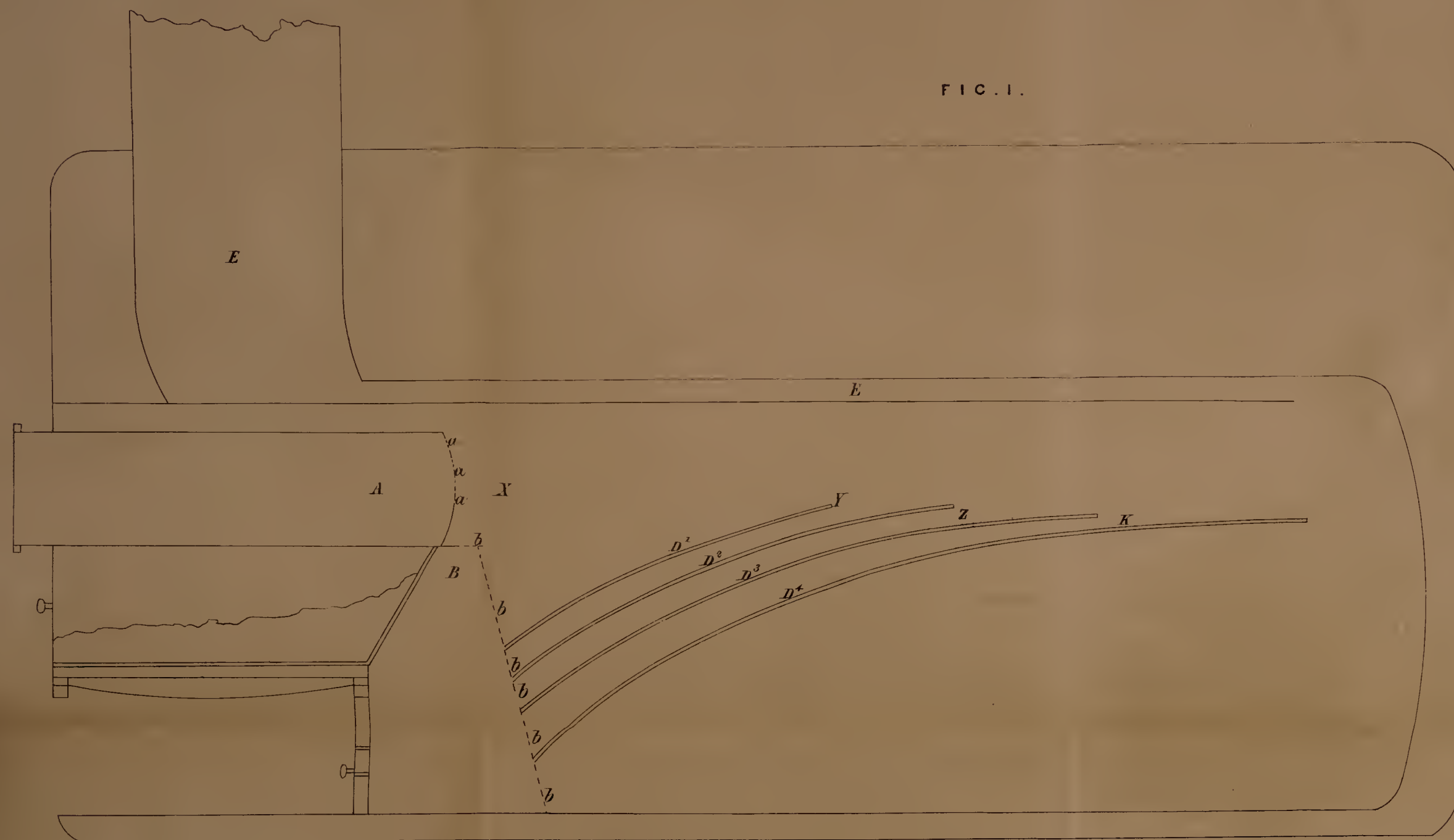


FIG. 2.

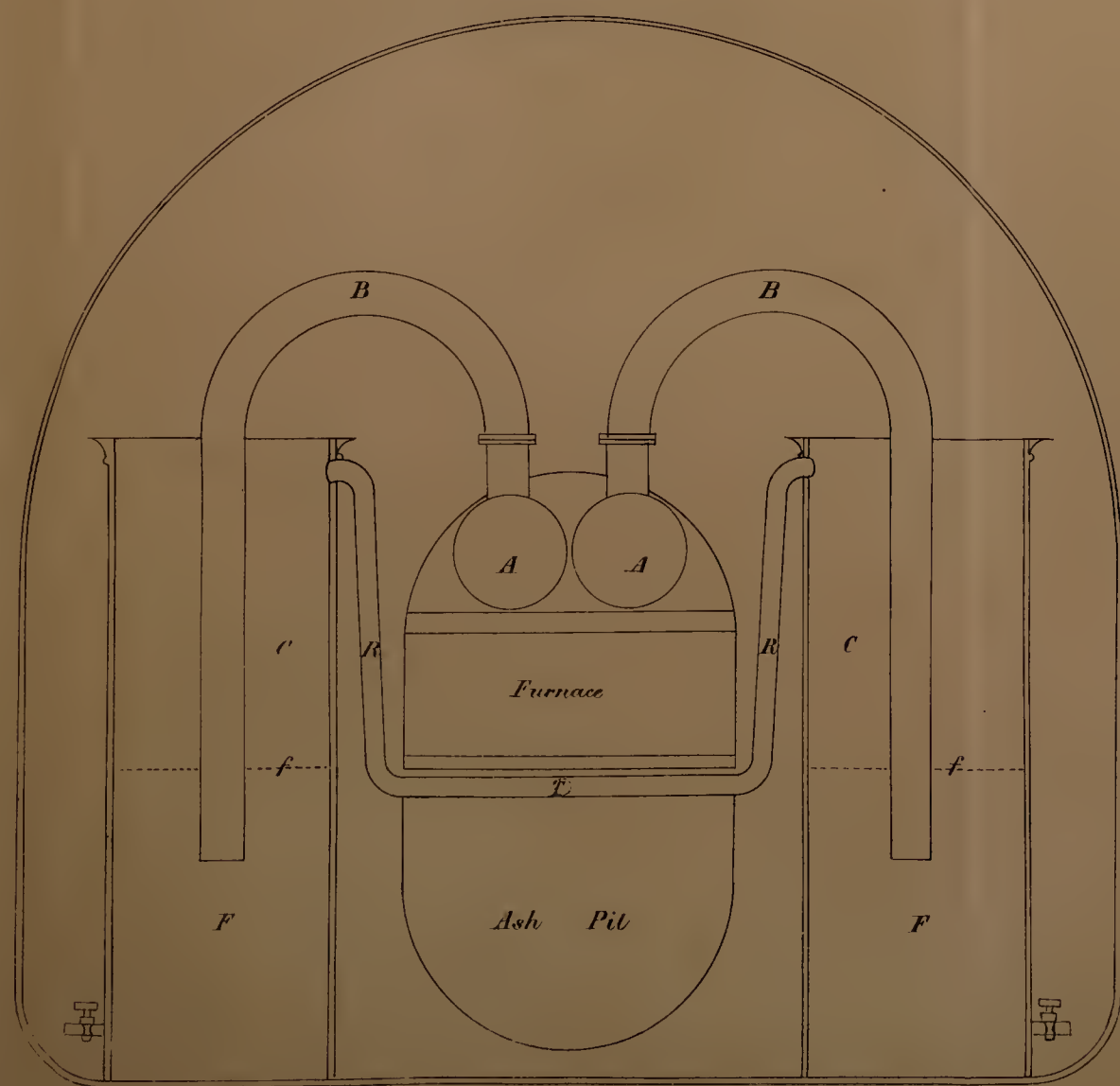
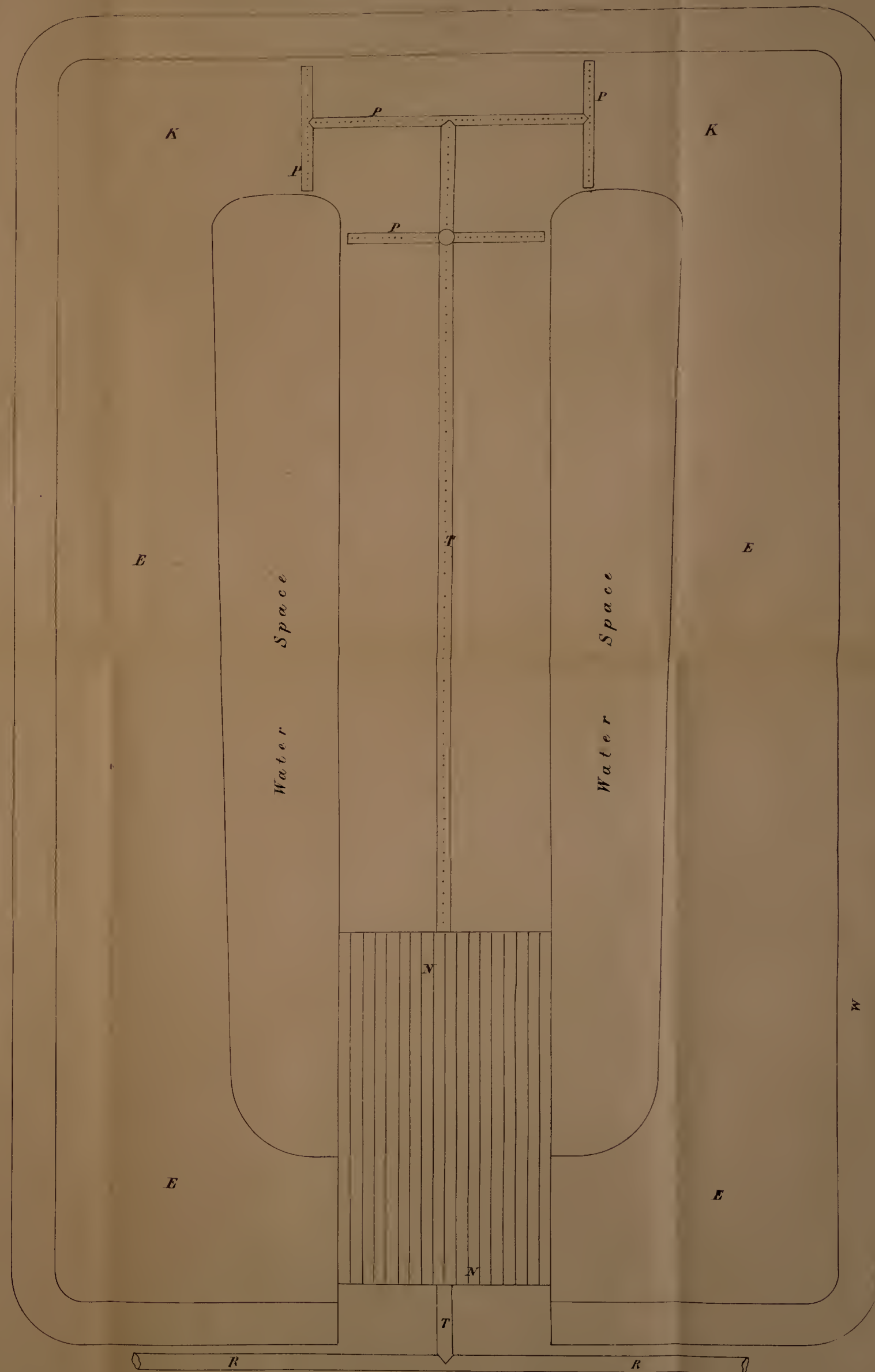


FIG. 3.



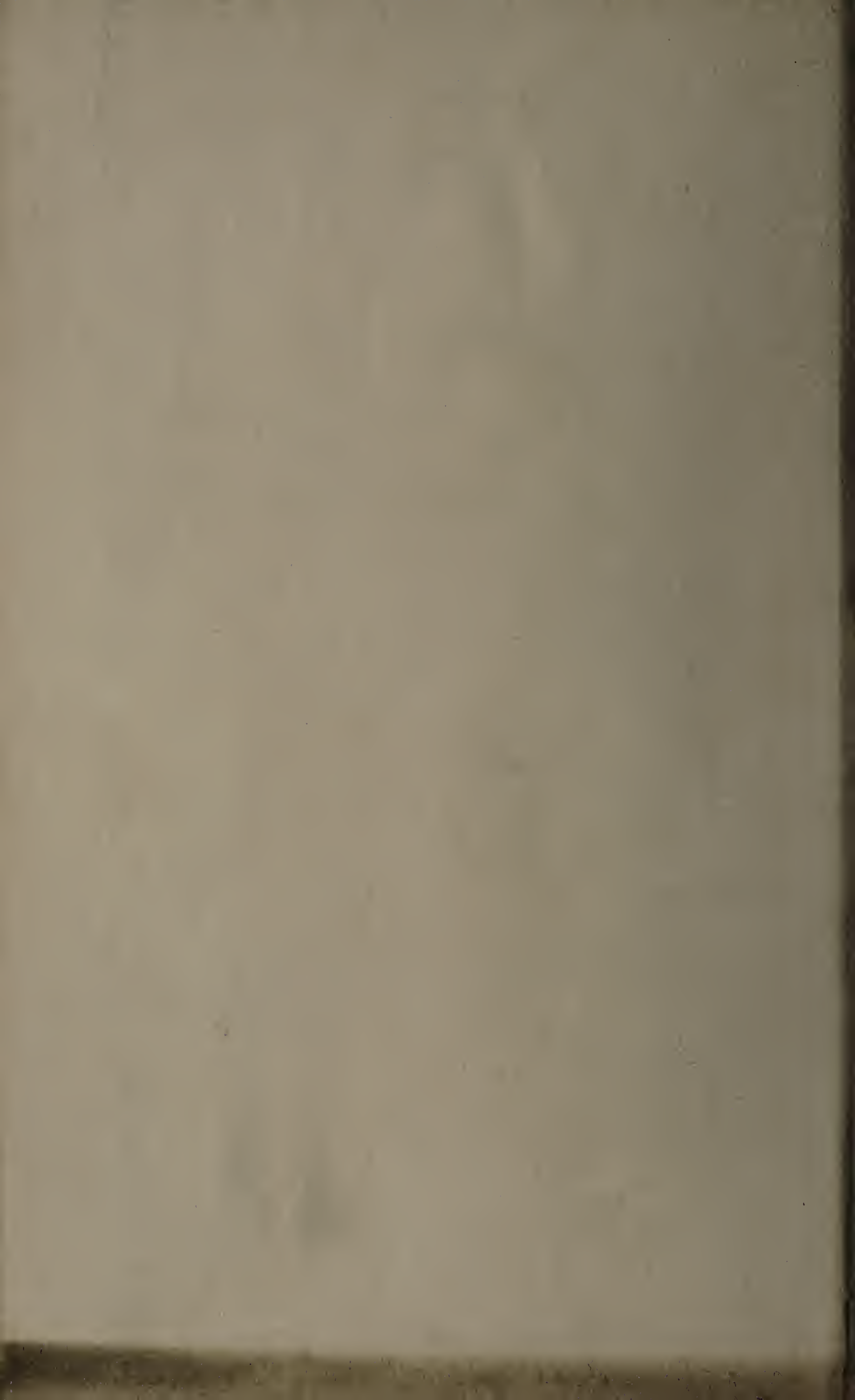


FIG. 9.

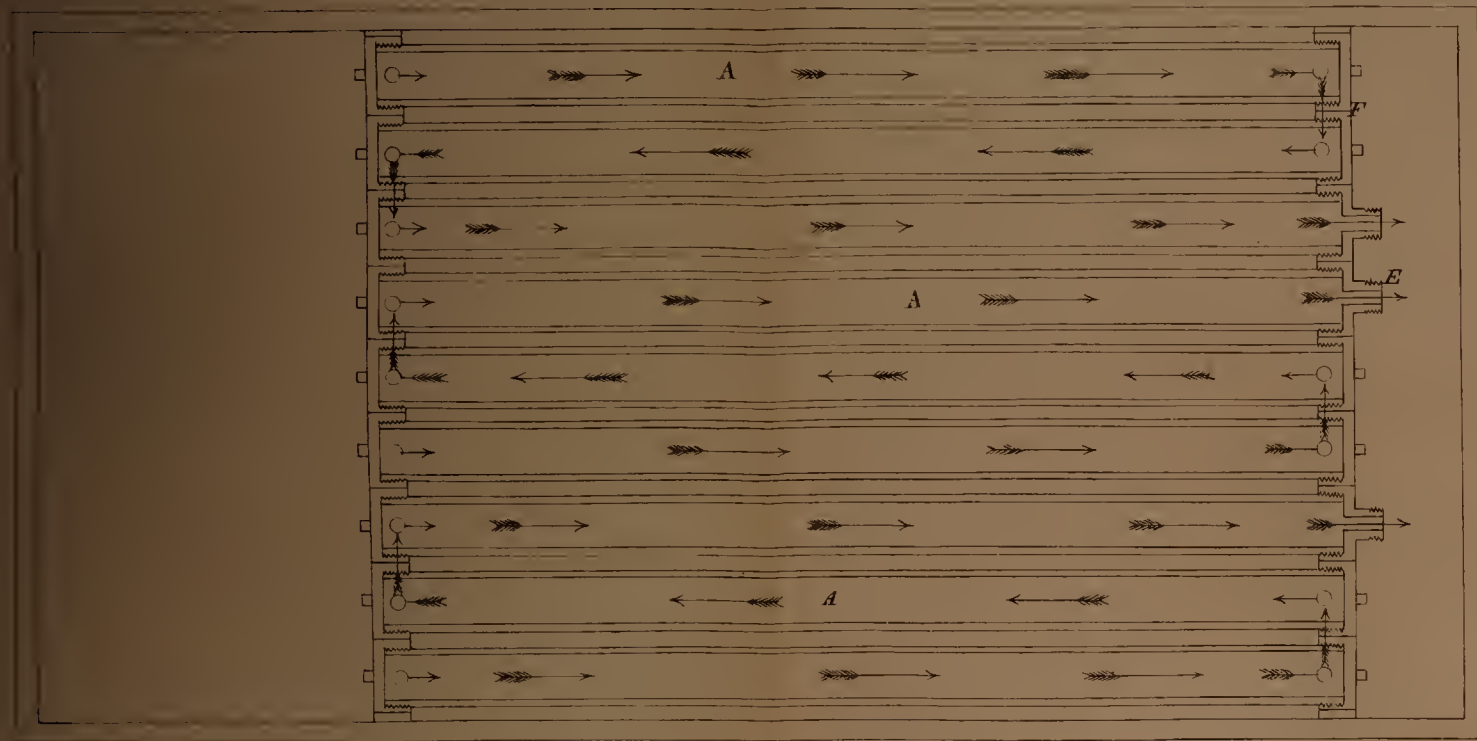


FIG. 8.

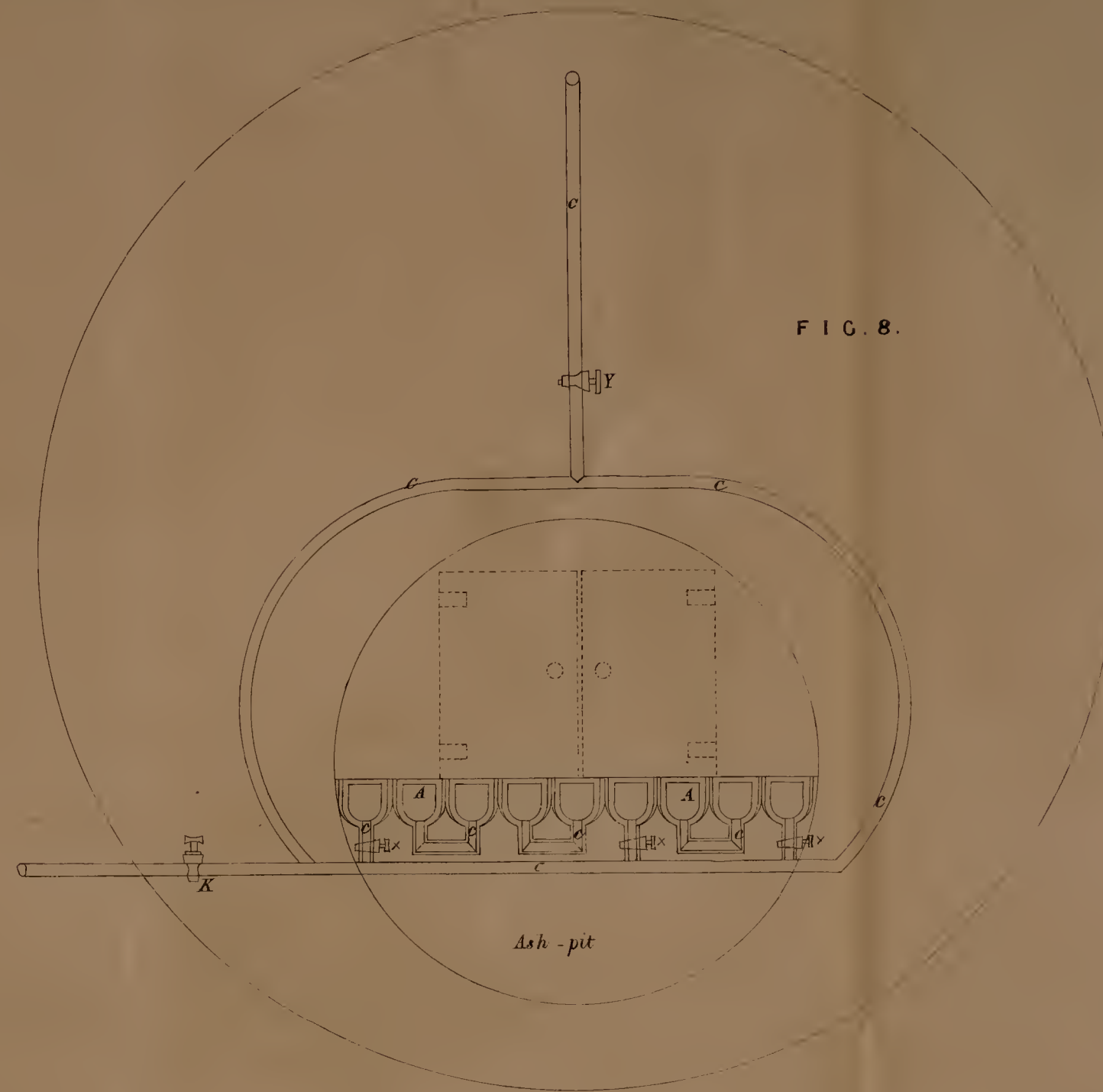


FIG. 10.

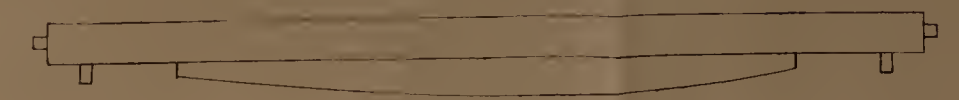


FIG. 11.

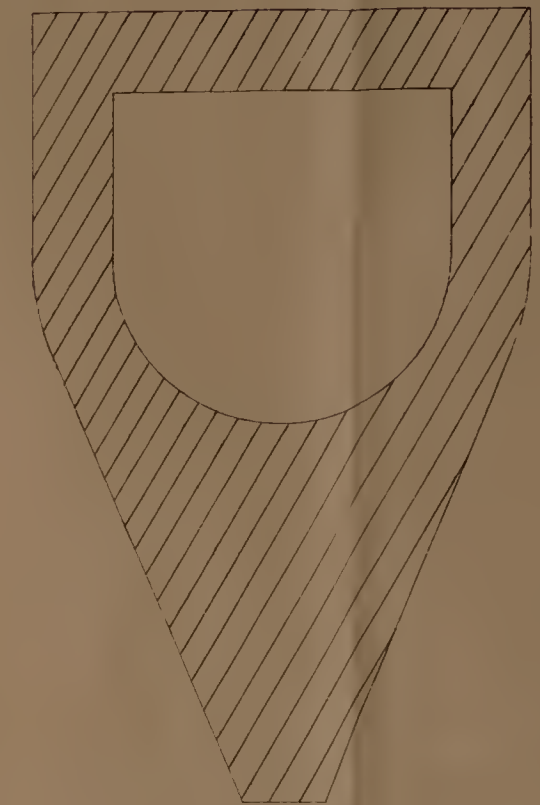


FIG. 4.

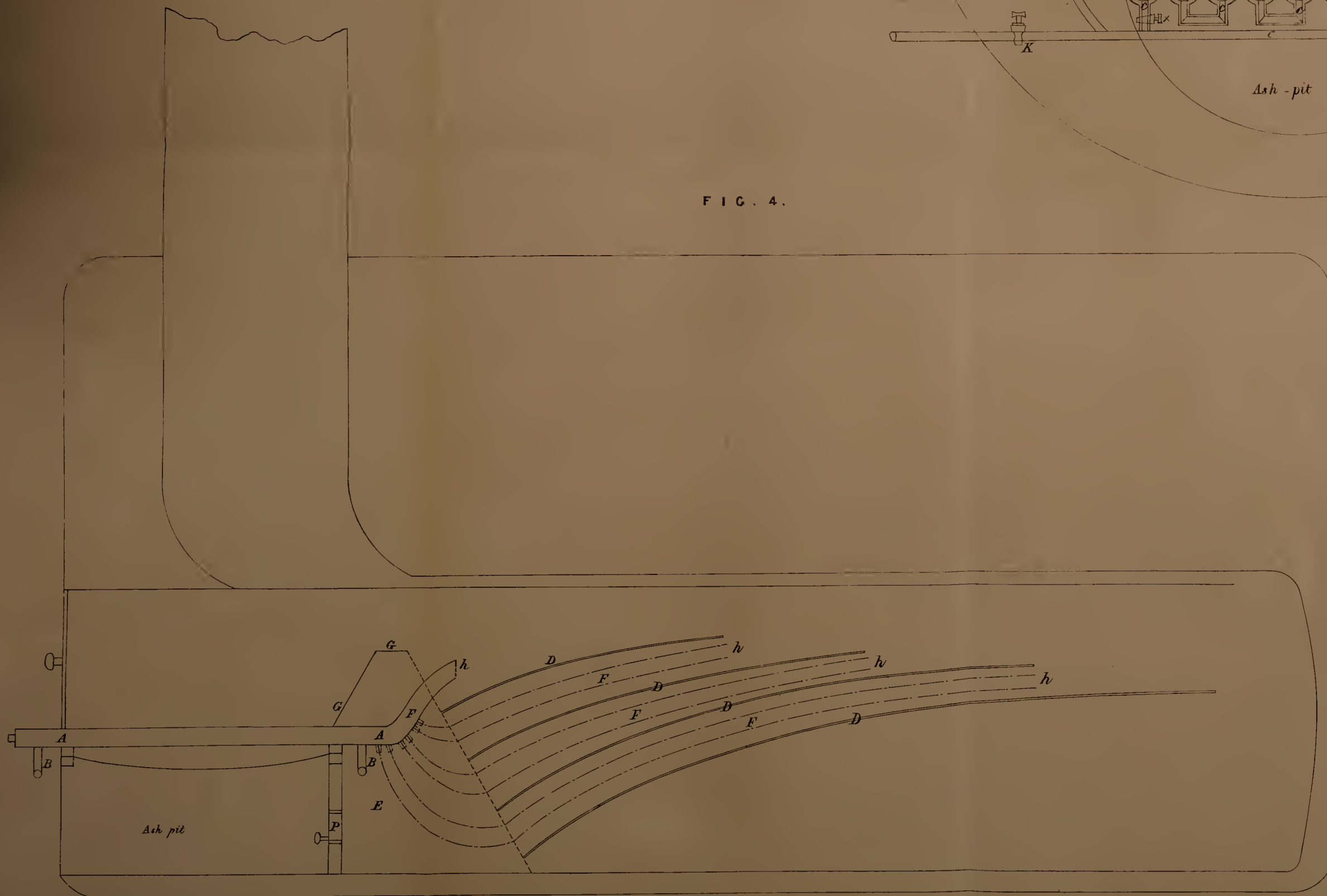


FIG. 7.

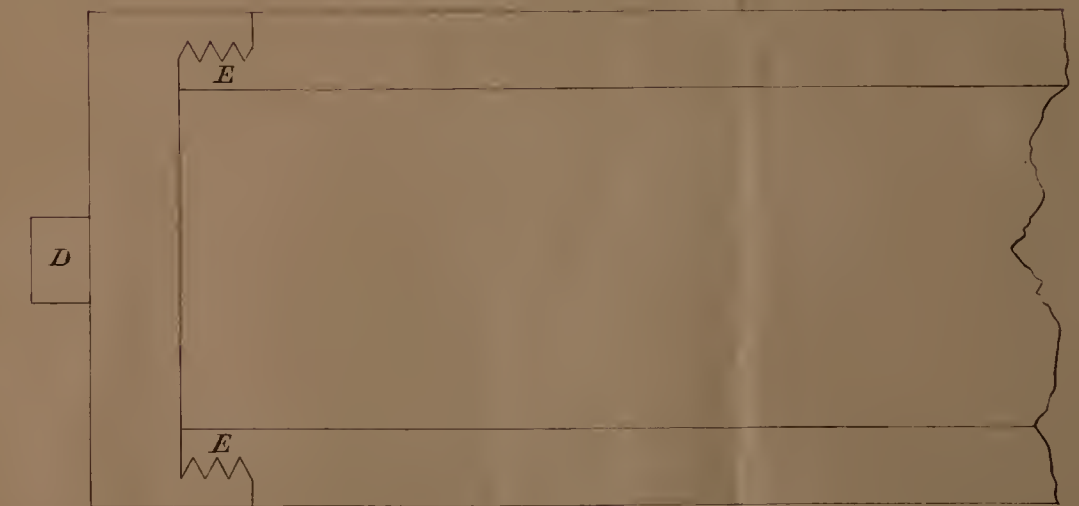


FIG. 6.

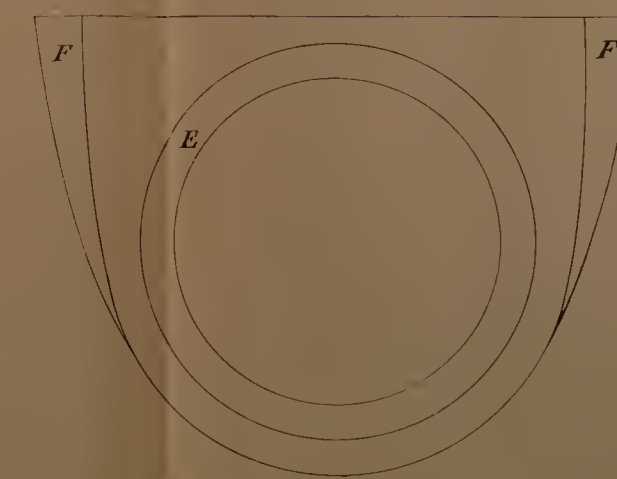


FIG. 5.

